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NEW HAMPSHIRE
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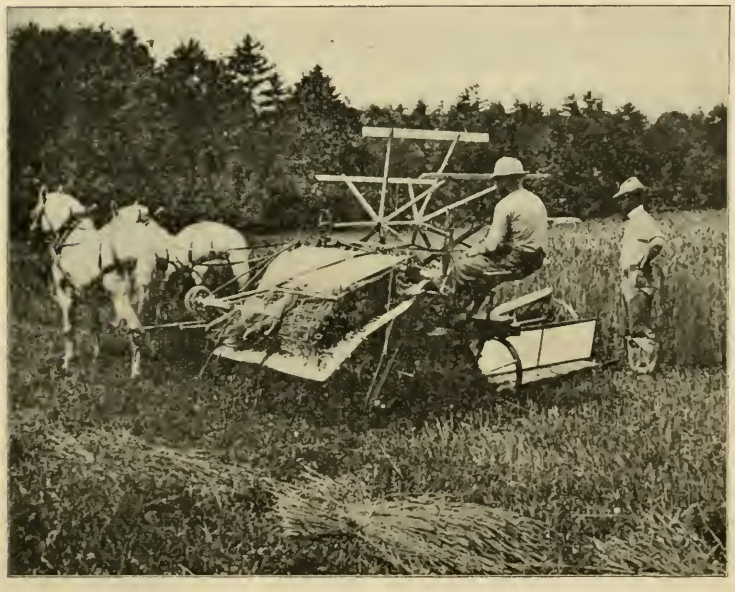
DEPARTMENT OF AGRONOMY

VARIETY TESTS OF OATS
BARLEY, WHEAT AND RYE.



"What shall the harvest be?"

By F. W. TAYLOR.

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND MECHANIC ARTS
DURHAM, N. H.

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VARIETY TESTS OF OATS, BARLEY, WHEAT AND RYE.

OATS.

The average annual production of oats in New Hampshire for the first eight years of the present decade has been, in round numbers, 400,000 bushels. As compared with the 4,500,000-bushel yield of Maine, our neighbor on the east, and with the 3,000,000-bushel yield of Vermont, our neighbor on the west, our own production seems rather small, as in fact it is, considering the opportunities for growing the crop which our soils and climate afford.

With a view of determining what varieties were most suitable, what might be their comparative yields, and what would seem to be the limiting factors in production in this state, the New Hampshire Agricultural Experiment Station began a series of tests in 1904 with the common varieties of oats offered for sale by New England seedsmen.

In all the field tests for the several years reported on the following pages the same kind and amount of fertilizers has been used. The following mixture of chemicals, containing 3.75 per cent. nitrogen, 10.75 per cent. phosphoric acid and 5 per cent. potash was applied each year at the rate of 400 pounds per acre at seeding time:

Nitrate of Soda,	200 pounds
Sulphate of Ammonia,	100 pounds
Tankage, "6–30" Grade,	500 pounds
Acid Phosphate,	1,000 pounds
Muriate of Potash,	200 pounds

The oats were in all cases sown as early in the spring as the ground could be prepared at the rate of 2 bushels per acre, the

seed and fertilizer being put in with a combined grass, grain and fertilizer drill. The tests were always made on the most uniform piece of ground that could be selected for that year, and although the type of soil varied from year to year, for any given year it was quite uniform on all of the plots. No manure was applied directly to the oat ground, but as a rule the oats were sown on corn ground which had been manured the year previous.

TESTS OF OATS IN 1904.

Size of plots.—204 x 21⅓ feet, one tenth acre.
Soil.—Brown loam 6 to 8 inches, underlaid by blue clay.
Date of seeding.—May 6.

Variety Name.	Source of seed.	Lbs. of straw per acre.	Type of panicle.
Lincoln	Breck	2920	Closed.
Black Gotham	Currie Bros	2800	Spreading.
Welcome	John. & Stokes	2900	Closed.
Mortgage Lifter	John. & Stokes	2810	Spreading.
Michigan Wonder	Hammond	2705	Spreading.
Imp. Prize Cluster	Currie Bros	3190	Spreading.
English Wonder	Hammond	2805	Spreading.
Silver Mine	Iowa Seed Co	2800	Spreading.
Black Tartarian	Breck	2710	Closed.
White Maine	John. & Stokes	2500	Closed.
White Russian	John. & Stokes	2110	Spreading.
Golden Fleece	Maule's	2890	Spreading.
Mold's Black	Maule's	3200	Closed.

Note.—All the varieties made a promising growth during the early summer. By July 22 all were headed out, but showed considerable smut. During the last week of July the rust struck them with such fatal results that the straw broke down at the fourth or fifth joints and no kernels matured. On August 10 the plots were cut with a mower, the straw dried, drawn to the barn and weighed.

TESTS OF OATS IN 1906.

Size of plots.—264 x 16½ feet, one tenth acre.
Soil.—Clay loam.
Date of seeding.—May 4.

Variety Name.	Source of seed.	Wt. per bu. of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.	Remarks.
Grey Winter	Breck	36 0	Aug. 20	19 7	2020	34 5	No rust.
Lincoln	Breck	37 0	Aug. 3	24 1	1930	36 5	Much rust.
Black Tartarian	Breck	42 0	Aug. 3	30 3	2480	35 5	Some rust.
Long's White Tartar	Breck	37 0	Aug. 3	35 3	2390	40 5	Some rust.
Lothian	Breck	44 0	Aug. 10	28 8	2800	37 5	Little rust.
Hamilton	Farquhar	42 0	Aug. 13	31 6	2490	39 5	Some rust.
Welcome	Farquhar	40 0	Aug. 3	38 1	3060	39 5	Much rust.
Common Western	Feed Bin	39 5	Aug. 3	29 7	1730	31 0	Much rust.

TESTS OF OATS IN 1907.

Size of plots.—109 x 20 feet, one twentieth acre.
Soil.—Clay.
Date of seeding.—May 6.

Variety Name.	Source of seed.	Wt. per bu. of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.	Remarks.
Bristol Black	Rennie Co	41 0	Aug. 10	65 0	3540	29 0	Some rust.
Fifty-pound Black	Rennie Co	41 5	Aug. 8	63 7	3480	29 0	Some rust.
Irish White	Rennie Co	35 0	Aug. 12	65 0	2610	31 5	Little rust.
Clydesdale	Ross Bros	32 5	Aug. 12	59 7	3330	31 0	Some rust.
Hamilton	Farquhar	41 5	Aug. 12	68 1	3510	34 5	Some rust.
Welcome	Farquhar	37 0	Aug. 8	52 5	2200	33 5	Little rust.
Lincoln	Breck	32 0	Aug. 8	57 5	2350	32 5	Some rust.
Long's White Tartar	N. H. Col.	39 0	Aug. 5	68 7	2540	32 0	Some rust.
Common Western	Feed Bin	36 0	Aug. 12	40 3	2210	28 0	Much rust.

TESTS OF OATS IN 1908.

Size of plots.—208 x 21 feet, one tenth acre.
Soil.—Clay loam, few ledges.
Date of seeding.—May 12.
Note.—On account of very dry weather oats did not fill well.

Variety Name.	Source of seed.	Wt. per bu. of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.	Remarks.
Welcome	Farquhar	37 0	Aug. 3	24 3	1860	35 5	Some rust.
Hamilton	Farquhar	42 5	Aug. 8	25 5	1900	29 0	Some rust.
Bristol Black	Rennie Co	40 0	Aug. 9	15 0	3650	28 5	Little rust.
Fifty-pound Black	Rennie Co	42 0	Aug. 7	13 9	3040	34 5	Some rust.
Dodd's White	Rennie Co	38 0	Aug. 2	20 8	1882	32 0	Much rust.
Clydesdale	Ross Bros	33 0	Aug. 4	24 6	2660	32 0	Some rust.
Long's White Tartar	Breck	36 0	Aug. 4	31 5	2097	33 5	Rust slight.
Lincoln	Breck	34 0	Aug. 4	31 0	2025	29 5	Some rust.
Kherson	Field Co	33 0	July 27	34 6	1350	28 0	Little rust.
Golden Fleece	Harris Co	36 0	Aug. 4	23 2	1470	29 0	Some rust.
Early Swedish	Garton Co	37 0	Aug. 3	21 5	1155	29 5	Little rust.
Common Western	Feed Bin	37 0	Aug. 1	28 8	2340	30 5	Much rust.

TESTS OF OATS IN 1909.

Size of plots.—138½ x 21 feet, one fifteenth acre.
Soil.—Clay.
Date of seeding.—May 13.

Variety Name.	Source of seed.	Wt. per bu. of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.	Remarks.
Lincoln	Gregory	34 5	Aug. 9	35 8	1777	33 0	Side out.
New Swedish	Gregory	34 0	Aug. 9	31 4	1710	30 0	Spreading.
Golden Sheaf	Sch. & Fot.	33 5	Aug. 9	28 3	1987	33 5	Side out.
American White	Sch. & Fot.	39 5	Aug. 12	34 2	2115	30 5	Side out.
Hamilton	Farquhar	44 0	Aug. 10	31 9	1365	29 5	Spreading.
Welcome	Farquhar	35 0	Aug. 8	40 0	1507	32 5	Side out.
King Oats	Breck	36 5	Aug. 9	39 0	1560	30 5	Side out.
Long's White Tartar	N. H. Col.	33 5	Aug. 7	33 1	1342	31 5	Side out.
Kherson	N. H. Col.	28 0	July 30	36 6	1545	30 5	Spreading.

Note.—On account of July drouth oats headed out short and did not fill well, very little rust.

In the following table are given the average of the five most promising varieties as compared with each other and with "common western" or oats taken from the feed bin at seeding time.

SUMMARY OF TESTS OF OATS, 1904 TO 1909.

Variety Name.	Yrs. of av.	Bus. of grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.	Lbs. straw per bu. of grain.
Long's White Tartar	4	42.1	2092	34.4	49.7
Hamilton	4	39.3	2316	33.1	58.9
Welcome	4	38.7	2156	35.2	55.7
Lincoln	4	37.1	2020	32.9	54.5
Kherson	2	35.6	1450	29.2	40.7
Common Western	3	32.9	2060	29.8	62.6

Long's White Tartar has a light colored berry, of good length and plump. The straw is not heavy and it does not rust badly.

Hamilton has a rather small and short berry with a light yellow color. The straw is stiff and coarse and is not much affected by rust.

Welcome is an old and popular variety with a light yellow berry, plump and of medium length. The straw is fairly stiff, but rather subject to rust.

Lincoln is a white oat with a short, plump berry. It is an old standard variety with straw of good length and strength, but subject to rust.

Kherson is one of the newer varieties imported from Russia about a dozen years ago, and is now a very popular variety in Kansas. The berries are dark yellow in color, small but numerous. The straw is short with broad leaves. These oats ripened a week or ten days earlier than any of the common varieties in the test. On account of its early maturity it is not much subject to rust, and although it has been tested for only two years it seems like a promising variety for grain production.

Common Western is not a variety, but represents the oats

bought in the open market for feed. The weight per bushel is usually high on account of the oats being clipped and containing more or less barley. The results would indicate that a greater yield of from five to ten bushels per acre can be obtained by sowing a regular variety of seed oats than by using the uncertain mixtures from the fed bin.

THE RUST OF OATS.

This disease is the result of a fungus which attacks the leaves and stems of the oat plant about the time it is heading out or in some cases several weeks before. Its presence is made manifest by the yellowish or reddish brown appearance of the oats which is caused by the clusters of fungus spores. The effect of the disease is a weakening of the vitality of the plant to such an extent that it fails to produce seed and frequently breaks down and dies. In some sections of the state the rust is unquestionably the worst pest of the oats. Although its depredations are somewhat periodic, being more disastrous some years than others, the most destructive attacks come in seasons of unusual moisture and warmth during the month of June, which induces the oats to make a large, quick growth. Whether this quick, succulent growth renders the plant more susceptible to the attacks of the fungus or whether the stated weather conditions are more congenial for the growth of the fungus, the writer is unable to say—perhaps both premises maintain.

Since no remedy for the disease is known, all that can be done in a practical way to combat it is to select those varieties for seeding which are in a measure, at least, rust resistant. Among these are Long's White Tartar, Hamilton and Kherson. The time of seeding also seems to have an appreciable effect upon the extent of rusting. The writer has frequently observed that early sown fields of oats have suffered less from rust than late sown ones.

In 1906, for the purpose of getting some data regarding the date of seeding as affecting the rust on oats, a series of small plots, 5 x 7 feet, were planted with the same variety (Welcome) at intervals of one week from April 20 to June 8. The plots being small, the yield of grain was not measured, but carefully estimated after an examination of the panicles.

Date of Seeding.	Date of ripening.	Amount of rust.	Est. bus. grain.
April 20	August 3	None	50
April 27	August 8	None	55
May 4	August 13	Slight	55
May 11	August 14	Slight	50
May 18	August 19	Considerable	40
May 25	August 22	Much	30
June 1	August 26	Much	25
June 8	September 6	Very bad	15

OAT SMUT.

Like the rust, the oat smut is a fungus disease which becomes conspicuous at blossoming time. The fungus is so easily recognized by the dirty, black, powdery appearance of the diseased panicles that no description of it is thought necessary in this connection. The loss from smut is much greater than is commonly supposed for three reasons:

1. The smutted stalks are usually shorter than the healthy ones, and are therefore not so easily observed.

2. The sheath leaves sometimes hide the smutted heads, which are then considered only as immature or barren plants.

3. The smut ripens several days before the healthy oats, and, unless the field is examined before cutting, many of the smut spores will have been blown away and the smutted stalks consequently overlooked.

In the earlier tests of the oat varieties at this station it was found that the percentage of smutted heads varied from 2 to 17 per cent., and that not a single commercial variety was free from it. During the past three seasons we have taken the precaution to treat all of our seed oats with formalin with the result that in only a very few cases have any smutted heads been found.

Formalin Treatment.—Take as many gallons of water as you have bushels of oats to treat. For each 12 gallons of water add one quarter pound of concentrated *formalin and mix thoroly.

* Concentrated formalin is a forty per cent. solution of formaldehyde gas in water. The liquid is clear and resembles water, except that it has a very sharp, pungent, penetrating odor. In buying, the concentrated or forty per cent. solution should be insisted upon.

Spread the oats upon a clean floor or in a wagon box to a depth of about 3 inches. With an ordinary sprinkling can or by dashing it with the hand from a bucket sprinkle the formalin solution over the layer of oats until the top is quite wet. Stir with a garden rake or shovel and repeat the sprinkling and stirring until all of the oats have been moistened, which will require about one gallon of solution for each bushel of grain. After the wetting has been completed stir the oats frequently so that they may dry rapidly without any germination being started. The oats may be treated either during the winter or just previous to sowing. Whatever receptacle is used for the oats after treatment should also be treated—if sacks, immerse them in the solution and then dry, if a bin sprinkle some of the solution on the sides and floor.

This method of treatment is easy, simple and cheap. Formalin may be purchased at any drug store for 50 to 60 cents per pound, thus making the cost for material only about 1 cent per bushel of grain. The cost of labor ought not to exceed 2 cents per bushel, making a total of 3 cents per bushel for the treatment complete.

From the results obtained here and from observations made elsewhere in the state it is estimated that the average amount of smut in oat fields grown from untreated seed is at least 5 per cent. This means that the annual loss from this cause alone is 20,000 bushels for the state, which at the average price of 60 cents per bushel is $12,000. Surely "an ounce of prevention is worth a pound of cure."

BARLEY.

In 1908 the station happened to have on hand some extra samples of different varieties of barley obtained upon the Chicago market the year previous. These were sown in one-twentieth acre plots on a heavy clay soil, at the rate of 2 bushels per acre, on May 13. The plots were manured and 350 pounds per acre of a "4–10–5" mixture of chemicals used. All the varieties came up nicely, but on account of the severe July drouth the straw was short and the heads did not fill well.

In 1909 five varieties were obtained from New England seedsmen and were sown May 13 in one-fifteenth acre plots on a stony

loam soil. No manure was used, but 500 pounds per acre of the "oats" mixture of chemicals was applied. On account of dry weather the straw was so short that it was almost impossible for the harvester to tie it. The heads were very well filled, but all the varieties were found to be impure, the beardless variety especially being badly mixed.

The following tabulation will show the detailed results of the test:

1908 TESTS OF BARLEY.

Variety Name.	Source of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.
2-Rowed Brewing	Chicago	Aug. 4	22.88	2580	53.0
Manscheuri	Chicago	July 30	18 74	1400	49.5
Oderbrucker	Chicago	Aug. 1	12 08	1740	51 0
Naked White	Chicago	Aug. 3	5.4	1580	61.0

1909 TESTS OF BARLEY.

Variety Name.	Source of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bu. of grain.
Beardless	Gregory	July 30	29.06	1710	34.5
Manscheuri	Gregory	July 30	18 90	1972	45 0
Caswell	Gregory	Aug. 10	26 10	2347	49 0
2-Rowed Brewing	Sch. & Fot	Aug. 10	18 75	1800	50 5
Black Hulles	Chicago	July 30	18 40	1380	60.2

In so far as yield, pleasantness of handling, and ease of threshing goes, the above tests show the Beardless variety to be in the lead. More extended trials, however, would be necessary to report conclusively upon the general adaptability of the different varieties to our conditions.

WINTER WHEAT.

In view of the fact that little or no wheat has been grown in the state in recent years, the writer was curious to know just how well it would withstand the winters and what the yield might be. Accordingly, small plots have been sown and harvested during the past three seasons, the results being given below in tabular form. The variety used was Dawson's Golden Chaff, a beardless winter sort with bronze chaff and a white berry. The seed was sown at the rate of two bushels per acre with the grain drill; 400 pounds per acre of acid phosphate was used as fertilizer; grass seed was sown on the plots in the following April, and without exception a good catch was secured.

The best yield was 30.75 bushels per acre obtained in 1907; the poorest was 10.3 bushels in 1908. This low yield was due in part to late seeding and the severe alternate freezings and thawings in the early spring. For the best results the seed should be sown between the 10th and the 20th of September. Corn or potato ground can be used to advantage for winter wheat by simply disking it thoroly. If plowed it should be rolled several times before seeding since wheat requires a fine but rather compact seed bed.

A mixture of wheat and winter vetch makes an excellent green forage crop for dairy cows. This may be sown at the rate of 1½ bushels of wheat and three pecks of vetch per acre. If the season is not unfavorable from 6 to 8 tons of green feed per acre can be secured.

SPRING WHEAT.

If wheat is desired for feeding poultry or other stock and it is not convenient to sow it in the fall a spring variety may be grown. In 1907 and 1908 a spring sort known as Fyfe was sown, and in 1909 Fyfe and Blue Stem were tried. The average yield of the four trials was 16.0 bushels per acre, the dry season of 1909 being unfavorable. The spring wheat should be sown at the rate of 7 to 8 pecks per acre, and should be gotten into the ground just as early in the spring as possible.

A fertilizer containing a liberal amount of nitrogen and phosphoric acid, say 4 and 10 per cent. respectively, will give the best

results; the quantity to apply will depend upon the fertility and the previous treatment of the land.

The following table presents in a summarized way the results of a three years' test with winter and spring wheat.

WINTER WHEAT.

	Type of soil.	Size of plot.	Date of seeding.	Date of ripening.	Bus. grain per acre.	Straw per acre.	Wt. per bu.
1906–'07	Clay	.75 A	Sept. 15	July 22	30 75	2580	60.
1907–'08	Loam	.85 A	Oct. 3	July 20	10 30	1460	60.
1908–'09	Loam	.70 A	Sept. 22	July 26	21.50	1825	61.
Average three years					20.85	1955	60 3

SPRING WHEAT.

	Type of soil.	Size of plot.	Date of seeding.	Date of ripening.	Bus. grain per acre.	Straw per acre.	Wt. per bu.
1907	Clay	$\frac{1}{20}$ A.	May 6	Aug. 19	18.2	3010	56.
1908	Loam	$\frac{1}{10}$ A.	May 12	Aug. 12	17 2	2190	57.
1909, Blue Stem	Clay	$\frac{1}{15}$ A.	May 13	Aug. 20	13 5	1147	61.
1909, Fyfe	Clay	$\frac{1}{15}$ A.	May 13	Aug. 20	15.1	1387	61
Average three years					16 0	1783	58 75

SPRING RYE.

A test to determine the yield of spring rye was made in 1908 on a one-tenth acre, and in 1909 on a one-fifteenth acre plot. The seeding was with the grain drill. At the rate of 7 pecks per acre, May 12, 1908, and May 13, 1909, 500 pounds per acre of fertilizer was used.

SPRING RYE TEST.

	Source of seed.	Date of ripening.	Bus. grain per acre.	Lbs. straw per acre.	Wt. per bus. grain.
1908	Harris	Aug. 5	18 30	2360	56 5
1909	Breck	Aug. 10	20 10	2182	56 0

SUMMARY.

1. While New Hampshire may never be able to compete with the great Northwest in the production of the staple cereal crops, the fact is nevertheless evident that very satisfactory yields of these crops can be obtained here in normal seasons. The high prices of grain feeds prevailing during the recent years are the results of changing economic conditions, and the New Hampshire farmer who adapts himself to these new conditions will find it more and more necessary to produce a larger share of the feeds at home.

2. In average seasons 40 bushels of oats per acre can be grown, and in favorable seasons a yield of 50 to 60 bushels can be expected.

3. The rust of oats can be partially controlled by selecting the more resistant varieties, and by early seeding.

4. The oat smut can be entirely eradicated by treating the seed with formalin solution.

5. Barley can be grown successfully with yields ranging from 18 to 28 bushels per acre.

6. Satisfactory yields of both winter and spring wheat can be obtained; the former variety will withstand the winter weather and outyield the spring variety.

7. Spring rye can be grown with fair success.

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